

2 WE CLAIM:

4 1. A walk reel mower, which comprises:

6 (a) a reel mower frame on which a power source is carried;

8 (b) an upwardly extending handle assembly connected at its lower end to the reel mower frame, the handle assembly including a portion which the operator can grip to guide the reel mower frame while the operator walks behind the reel mower frame;

12 (c) a traction drive for propelling the reel mower frame across the ground, the traction drive being powered by the power source;

14 (d) a reel cutting unit carried on the front of the reel mower frame, the reel cutting unit having a reel cutting unit frame which carries:

18 (i) a helically bladed cutting reel which is rotatable about a substantially horizontal, transverse axis;

20 (ii) a bedknife which cooperates with the cutting reel such the rotatable cutting reel sweeps standing grass against the bedknife to cut the grass; and

22 (iii) front and rear ground engaging wheel or roller supports for allowing the reel cutting unit to be self supporting and to move over the ground; and

24 (e) a suspension system comprising relatively rigid links pivotally connecting the reel cutting unit frame to the reel mower frame such that the reel cutting unit can roll about a substantially horizontal, longitudinal axis.

30 2. The walk reel mower of claim 1, wherein the suspension system comprises at least one pair of inclined rigid links for pivotally connecting the reel cutting unit frame to the reel mower frame such that the reel cutting unit can roll about the longitudinal axis.

2           3. The walk reel mower of claim 2, wherein each link  
4 is located offset from a longitudinal centerline of the reel  
6 cutting unit so that the links are on opposite sides of the  
8 centerline, and wherein the links are further inclined inwardly  
10 relative to one another and relative to a vertical line passing through the upper end of each link so that the lower end of each link is closer to the longitudinal centerline of the reel cutting unit than is the upper end of each link.

12           4. The walk reel mower of claim 2, wherein lines drawn  
14 through the links are inclined towards each other and will  
16 intersect at a focal point, and wherein the focal point is located relatively low with respect to the reel cutting unit.

18           5. The walk reel mower of claim 4, wherein the focal  
20 point is located along the longitudinal axis about which the cutting unit rolls.

22           6. The walk reel mower of claim 5, wherein the focal  
24 point is at the center of the bedknife when the reel cutting unit is sitting on flat and level ground.

26           7. The walk reel mower of claim 2, wherein the suspension system further includes relatively rigid arms for pivotally connecting the reel cutting unit frame to the reel mower frame such that the reel cutting unit can pitch about a substantially horizontal, transverse axis.

32           8. The walk reel mower of claim 7, further including a  
34 cutting unit carrier frame that includes a transverse cross member having downwardly extending, vertical support arms at either end thereof, wherein the inclined rigid links extend  
36

between the cross member of the carrier frame and the reel mower frame, and wherein the vertical support arms are pivotally connected to the reel cutting unit frame.

9. The walk reel mower of claim 8, wherein the lower end of each vertical support arm includes an inwardly protruding circular hub which rotatably engages or journals a shaft of the cutting reel.

10. The walk reel mower of claim 7, wherein lines drawn through the links are inclined towards each other and will intersect at a focal point, and wherein the focal point is located beneath the attachment of the vertical arms to the reel cutting unit frame.

11. A walk reel mower, which comprises:

(a) a reel mower frame on which a power source is carried;

(b) an upwardly extending handle assembly connected at its lower end to the reel mower frame, the handle assembly including a portion which the operator can grip to guide the reel mower frame while the operator walks behind the reel mower frame;

(c) a traction drive for propelling the reel mower frame across the ground, the traction drive being powered by the power source;

(d) a reel cutting unit carried on the reel mower frame, the reel cutting unit having a cutting reel which is rotatable about a substantially horizontal, transverse axis which reel cooperates with a bedknife to cut grass; and

(e) at least one pair of inclined rigid links for pivotally connecting the reel cutting unit frame to the reel mower frame such that the reel cutting unit can roll about a longitudinal axis, wherein each link in the at least one pair is located offset from a longitudinal centerline of the

2 reel cutting unit so that the links are on opposite sides of  
the centerline, and wherein the links in the at least one  
4 pair are further inclined inwardly relative to one another  
and relative to a vertical line passing through the upper  
6 end of each link so that the lower end of each link is  
closer to the longitudinal centerline of the reel cutting  
unit than is the upper end of each link.

8  
10 12. The walk reel mower of claim 11, wherein lines  
drawn through the links are inclined towards each other and  
will intersect at a focal point located at the center of the  
12 bedknife.

14 13. A walk reel mower, which comprises:

16 (a) a reel mower frame on which a power source is  
carried;

18 (b) an upwardly extending handle assembly connected at  
its lower end to the reel mower frame, the handle assembly  
including a portion which the operator can grip to guide the  
20 reel mower frame while the operator walks behind the reel  
mower frame;

22 (c) a traction drive for propelling the reel mower  
frame across the ground, the traction drive being powered by  
24 the power source;

26 (d) a reel cutting unit carried on the reel mower  
frame, the reel cutting unit having a cutting reel which is  
rotatable about a substantially horizontal, transverse axis  
28 which reel cooperates with a bedknife to cut grass;

30 (e) a reel drive for powering the cutting reel, the  
reel drive being powered by the power source; and

32 (f) a single gearbox for housing the traction drive  
and the reel drive.

34 14. The walk reel mower of claim 13, further including  
separate clutches used to initiate the traction drive and  
36

2 the reel drive with the separate clutches both being con-  
tained within the gearbox.

4 15. The walk reel mower of claim 13, wherein the trac-  
tion drive includes a differential and speed reduction gear-  
6 ing, and wherein the differential and at least some of the  
speed reduction gearing of the traction drive are contained  
8 within the gearbox.

10 16. The walk reel mower of claim 13, wherein the gear-  
box also houses a parking brake.

12 17. The walk reel mower of claim 16, wherein the park-  
14 ing brake comprises a tightenable band brake.

16 18. The walk reel mower of claim 17, wherein the band  
brake of the parking brake is tightenable around a drum  
18 within the gearbox, the band brake when tightened acting on  
gearing of the traction drive to prevent the traction drive  
20 from rotating.

22 19. The walk reel mower of claim 13, wherein the trac-  
tion drive comprises:

24 (i) a planetary gear carrier having a  
plurality of planetary gears rotating around a sun gear with  
26 the planetary gears and sun gear being continuously driven  
by the power source when the power source is operating;

28 (ii) a traction drive clutch drum in engage-  
ment with the planetary gear carrier and rotating therewith;

30 (iii) a ring gear concentrically received  
around the planetary gear carrier and capable of independent  
32 rotation relative to the planetary gear carrier, the  
planetary gears on the planetary gear carrier in engagement  
34 with the ring gear and normally rotating around the ring  
gear when the traction drive is not actuated;

2 (iv) a traction drive gear operatively  
coupled to the ring gear, the traction drive gear further  
4 being operatively coupled to ground engaging traction drive  
wheels or drums; and

6 (v) a brake for engaging the traction drive  
clutch drum to stop movement of the planetary gear carrier  
8 such that the continued rotation of the planetary gears will  
then rotate the ring gear and the traction drive gear to  
10 power the ground engaging traction drive wheels or drums.

12 20. The walk reel mower of claim 19, wherein the brake  
comprises a band brake tightenable around the traction drive  
14 clutch drum.

16 21. The walk reel mower of claim 19, wherein the trac-  
tion drive further includes a differential operatively  
18 coupled to the traction drive gear to power the ground  
engaging traction drive wheels or drums through independent  
output shafts.

20 22. The walk reel mower of claim 13, wherein the trac-  
tion drive comprises a planetary speed reduction gear me-  
22 chanism within the gearbox.

24 23. A traction drive for a walk reel mower having  
26 ground engaging, traction drive elements for propelling the  
walk reel mower over the ground, which comprises:

28 (a) a planetary gear carrier having a plurality of  
planetary gears rotating around a sun gear with the  
30 planetary gears and sun gear being continuously driven by a  
power source on the walk reel mower when the power source is  
32 operating;

34 (b) a traction drive clutch drum in engagement with  
the planetary gear carrier and rotating therewith;

36 (c) a traction drive gear operatively coupled to the  
planetary gears, the traction drive gear further being oper-

2 actively coupled to the ground engaging traction elements;  
3 and

4 (d) a selectively operable brake for engaging the  
5 traction drive clutch drum to stop movement of the planetary  
6 gear carrier such that the continued rotation of the  
7 planetary gears will then rotate the traction drive gear to  
8 power the ground engaging traction drive elements.

10 24. The traction drive of claim 23, wherein the trac-  
11 tion drive elements comprise left and right traction drum  
12 halves.

14 25. The traction drive of claim 23, wherein the left  
15 and right traction drum halves are driven by the traction  
16 drive gear through a differential.

18 26. The traction drive of claim 23, wherein the brake  
19 comprises a band brake tightenable around the traction drive  
20 clutch drum.

22 27. The traction drive of claim 23, wherein the trac-  
23 tion drive gear is connected to a ring gear that concentri-  
24 cally surrounds a portion of the planetary gear carrier, the  
25 planetary gears on the planetary gear carrier being in  
26 engagement with the ring gear to be thereby coupled to the  
27 traction drive gear.

28 28. The traction drive of claim 27, wherein the trac-  
29 tion drive further includes:

30 (a) a parking brake clutch drum on the ring gear; and

32 (b) a parking brake for engaging the parking brake  
33 clutch drum to prevent rotation of the traction drive when  
34 the power source is not operating to restrain unintended  
35 movement of the walk reel mower.

29. The traction drive of claim 28, wherein the parking brake clutch drum is located between the ring gear and the traction drive gear.

30. The traction drive of claim 23, wherein the parking brake comprises a tightenable band brake located around the parking brake clutch drum.

31. A drive shaft for transferring rotational torque to a reel cutting unit of a reel mower, which comprises:

a drive shaft that has an expandable length and is flexible between each end thereof to accommodate movement of the reel cutting unit relative to the reel mower, wherein the drive shaft is self-lubricating without using petroleum based lubricants.

32. The drive shaft of claim 31, wherein each end of the drive shaft includes a flexible helix beam coupler.

33. The drive shaft of claim 32, wherein each flexible helix beam coupler includes a stub shaft with the stub shafts on each beam coupler pointing towards one another but not contacting one another, and further including an intermediate coupler coupling the stub shafts together such that each stub shaft can slide in and out relative to the intermediate coupler, wherein the stub shafts and intermediate coupler have mating, non-circular cross-sectional configurations.

34. The drive shaft of claim 31, wherein the intermediate coupler is made from a plastic material impregnated with a non-oil based lubricant.

35. A walk reel mower, which comprises:

(a) a reel mower frame on which a power source is carried;



2 (b) an upwardly extending handle assembly connected at  
its lower end to the reel mower frame, the handle assembly  
4 including a portion which the operator can grip to guide the  
reel mower frame while the operator walks behind the reel  
mower frame;

6 (c) a traction drive for propelling the reel mower  
frame across the ground, the traction drive being powered by  
8 the power source;

10 (d) a reel cutting unit carried on the reel mower  
frame, the reel cutting unit having a cutting reel which is  
12 rotatable about a substantially horizontal, transverse axis  
which reel cooperates with a bedknife to cut grass;

14 (e) a reel drive for powering the cutting reel, the  
reel drive being powered by the power source; and

16 (f) a single control handle carried on the handle as-  
sembly for selectively controlling the operation of both the  
traction drive and the reel drive.

18  
20 36. The walk reel mower of claim 35, wherein the con-  
trol handle rotates back and forth about a substantially  
horizontal pivot pin to control the operation of one of the  
22 traction drive and the reel drive.

24 37. The walk reel mower of claim 36, wherein the con-  
trol handle includes a laterally displaceable toggle at the  
26 top which can be pivoted back and forth about another pivot  
pin to displace the toggle from a first position in which  
28 the toggle is aligned with the control handle to a second  
position in which the toggle is bent to one side out of  
30 alignment with the control handle, the toggle controlling  
the operation of the other of the traction drive and the  
32 reel drive.

34 38. The walk reel mower of claim 37, wherein the con-  
trol handle controls the operation of the traction drive and  
36 the toggle controls the operation of the reel drive.

2           39. The walk reel mower of claim 37, wherein displac-  
4 ing the toggle is connected to a reciprocal rod extending  
6 through the control handle, wherein the reciprocal rod is  
8 extended relative to the control handle when the toggle is  
in the second position thereof to couple the control handle  
to the reel drive so that pivoting motion of the control  
handle about the first pivot pin actuates both the traction  
and reel drives.

10           40. A walk reel mower, which comprises:

12           (a) a reel mower frame on which a power source is  
carried;

14           (b) an upwardly extending handle assembly connected at  
its lower end to the reel mower frame, the handle assembly  
16 including a portion which the operator can grip to guide the  
reel mower frame while the operator walks behind the reel  
18 mower frame;

20           (c) a traction drive for propelling the reel mower  
frame across the ground, the traction drive being powered by  
the power source;

22           (d) a reel cutting unit carried on the reel mower  
frame, the reel cutting unit having a cutting reel which is  
24 rotatable about a substantially horizontal, transverse axis  
which reel cooperates with a bedknife to cut grass;

26           (e) a reel drive for powering the cutting reel, the  
reel drive being powered by the power source; and

28           (f) means on the handle assembly for allowing the op-  
erator to selectively control the operation of both the  
30 traction drive and the reel drive, wherein the controlling  
means includes a single pivotal control handle having a tog-  
32 gle that can be toggled to one side so that pivoting motion  
of the control handle will actuate both the traction drive  
and the reel drive and movement of the toggle into an  
34 aligned position with the control handle will release the  
36 reel drive while leaving the traction drive engaged.

2           41. A walk reel mower, which comprises:

4           (a) a reel mower frame on which a power source is  
carried;

6           (b) an upwardly extending handle assembly connected at  
its lower end to the reel mower frame, the handle assembly  
8 including a portion which the operator can grip to guide the  
reel mower frame while the operator walks behind the reel  
mower frame;

10          (c) a reel cutting unit carried on the front of the  
reel mower frame, the reel cutting unit having a reel cut-  
12 ting unit frame which carries:

14           (i) a helically bladed cutting reel which is  
rotatable about a substantially horizontal, transverse axis;  
and

16           (ii) a bedknife which cooperates with the  
cutting reel such the rotatable cutting reel sweeps standing  
18 grass against the bedknife to cut the grass;

20          (d) a grass basket attached to the reel cutting unit  
frame ahead of the cutting reel and the bedknife, wherein  
the grass basket is attached to the reel cutting unit frame  
22 by pins on the basket received in sockets on the reel cut-  
ting unit frame, and wherein the pins and sockets are con-  
24 figured relative to one another so that the grass basket  
will not be disengaged if the operator lifts up on the hand-  
26 le assembly.

28          42. The walk reel mower of claim 41, wherein each  
socket comprises an upwardly facing trough which includes an  
30 upwardly open front portion and an upwardly closed rear por-  
tion.

32          43. The walk reel mower of claim 42, wherein the  
34 trough forming each socket is upwardly inclined as it ex-  
tends forwardly.

2           44. The walk reel mower of claim 43, wherein each pin  
4 includes a downwardly inclined distal leg that is configured  
6 so that when the grass basket is flat and level the angle of  
8 inclination of the distal leg matches the angle of inclina-  
tion of the socket allowing the distal leg to be inserted  
into the socket.

10           45. A reel cutting unit for a reel mower, which com-  
prises:

12           (a) a reel cutting unit frame comprising spaced side  
plates connected to an arcuate back plate;

14           (b) a helically bladed cutting reel rotatably journal-  
led between the side plates and positioned in front of the  
back plate;

16           (c) a bedknife extending between the side plates along  
the length of cutting reel for cooperating with the cutting  
18 reel to cut grass, the bedknife being pivotally adjustable  
relative to the side plates to compensate for wear in the  
20 cutting reel; and

22           (d) wherein the pivot axis of the bedknife is chosen  
such that the front edge of the bedknife stays in approxi-  
24 mately the same longitudinal location relative to the cut-  
ting reel as the front edge of the bedknife rises upwardly  
to compensate for wear in the cutting reel.

26           46. A reel cutting unit for a reel mower, which com-  
28 prises:

30           (a) a reel cutting unit frame comprising spaced side  
plates connected to an arcuate back plate;

32           (b) a helically bladed cutting reel rotatably journal-  
led between the side plates and positioned in front of the  
back plate;

34           (c) a bedknife extending between the side plates along  
the length of cutting reel for cooperating with the cutting  
36 reel to cut grass; and

2 (d) wherein at least portion of the back plate has a  
closed tubular cross-sectional configuration.

4 47. The reel cutting unit of claim 46, wherein the  
back plate is an extruded aluminum back plate.

6 48. The reel cutting unit of claim 46, wherein the  
8 back plate has an upper portion which has the closed tubular  
cross-sectional configuration.

10 49. The reel cutting unit of claim 48, wherein the  
12 back plate has a lower lip extending from the upper portion,  
the lower lip of the back plate having a solid, non-tubular  
14 cross-sectional configuration with a thickness which is sub-  
stantially less than the width of the upper portion of the  
16 back plate.

18 50. A back plate for a reel cutting unit of a reel  
mower, the back plate forming a portion of the reel cutting  
20 unit frame and being arcuate with a cutting reel of the reel  
cutting unit positioned in front of the back plate, which  
22 comprises:

24 a back plate at least a portion of which has a closed  
tubular cross-sectional configuration.